impregnating the resin mixture into the fiber-based filler;

forming the impregnated fiber-based filler into a shape of a protective helmet;

A8

and

curing the resin mixture.

Remarks

The specification and claims 1, 17, 23, 36 and 42 have been amended, and new claims 56-59 have been added. Marked-up copies of the amended portions of the specification and the amended claims, illustrating the changes thereto, accompany this amendment. Review and reconsideration are respectfully requested.

The second full paragraph of page 3 has been corrected as requested in the Office action. Furthermore, the second full paragraph of page 7 has been amended to remove the reference numbers "26a" and "26b" which are not included in the drawings, and to make other corrections. Finally, claims 1, 17, 23, 36 and 42 have been amended to address the 35 U.S.C. §112 rejections.

Applicant hereby confirms its election to prosecute the invention of Group I (claims 1-37 and 42-55) without traverse.

Claims 1, 8, 11, 17, 42, 49 and 52 are rejected as allegedly defining obvious subject matter over U.S. Pat. No. 4,656,674 to Medwell in view of the Japanese '106 patent. In particular, the Office action takes the position that the Medwell reference discloses the basic claimed process of the invention, but does not teach a thermosetting resin-impregnated fabric having ceramic particles mixed therein. The Office action then takes the position that it would have been obvious to one of ordinary skill in the art to provide the thermosetting resin-impregnated fabric having ceramic particles mixed therein, as taught by the Japanese '106 reference, and to use such a ceramic fabric in the process of the Medwell reference. However,

for the reasons discussed below it is submitted that one of ordinary skill in the art would not be motivated to carry out the proposed modification.

In particular, it is submitted that one of ordinary skill in the art would not be motivated to provide the thermosetting resin/ceramic powder mixture of the Japanese '106 reference in the process of the Medwell reference because the resultant structure would not satisfactorily function as a helmet. As noted at page 3, line 17 of the translation of the Japanese '106 reference (a copy of which in included in the attached Information Disclosure Statement), the ceramic fiber of that reference is flexible, and maintains flexibility similar to that of a fiber cloth. Also, at page 4, lines 18-19, it is noted that the fibers are preferably made of cotton or hemp, and the flexibility of the resultant fiber cloth is again emphasized. Finally, at page 6, lines 3-8, the translation notes:

> The features of said ceramic fiber cloth are that it does not have the "hard" image of conventional ceramics, it has strength without loss of the flexibility characteristic which fiber cloth possesses, it is easy to cut following molding without fall-out of the ceramic powder occurring, and it has an adhesiveness property and a wide range of uses.

Thus, the Japanese '106 reference emphasizes that the ceramic fiber cloth of that reference is not "hard" but is instead flexible and can be easily cut. In fact, the Japanese '106 reference indicates that the flexible sheeting of that reference can be used as bedding and outfits for protection against cold, which are necessarily soft and conforming.

In contrast, protective helmets, such as the helmet of the Medwell reference, must be hard and rigid to provide impact resistance. For example, column 1, lines 6-8 of the Medwell reference acknowledges that composite helmets should be made of a "strong fabric."

Furthermore, fire fighter or protective helmets are generally required to meet National Fire Protection Association ("NFPA") standards. Attachment A is a copy of sections 6-15, 6-16 and 6-19 of the NFPA 1971-2000 helmet standards, which address the top impact test, the acceleration impact test, and the penetration test for helmets. respectively, applied to a helmet

made in accordance with the steps of this invention. As can be seen from the standards of Attachment A, helmets are tested for impact resistance by, for example, dropping a steel drop mass having a spherical striking face and specified dimensions, and the resultant transmitted force is then measured. The impact resistance tests are repeated under various conditions (i.e. in high temperatures, after the helmet has been submersed in water, etc.)

The NFPA acceleration test specifies maximum accelerations that can be experienced upon application of an applied force, and the NFPA penetration test specifies the maximum penetration of a helmet when struck with a defined penetration striker. Of course, it is also commonly known and understood that a helmet should protect the wearer from impacts and falling debris.

Thus, the hardness or rigidity of helmets is an important feature, and the Japanese '106 reference discloses that the resultant ceramic fiber cloth of that reference is flexible and not rigid. It is clear that the ceramic fiber cloth of the Japanese '106 reference would not protect a wearer from impacts, accelerations, or penetrations, and it is submitted that one of ordinary skill in the art would not be motivated to use the ceramic fiber cloth of the Japanese '106 reference in the helmet of the Medwell reference.

Furthermore, the Japanese '106 reference contemplates use of a thermosetting urea resin which inherently results in a weak, unstable product. For example, Attachment B is a copy of a paper entitled "Urea-Formaldehyde Adhesive Resins" by Anthony Conner, Forest Products Laboratory of the USDA Forest Service. As noted on the second page (page 8497, bottom of the first column - top of the second column) of that article, urea resins are not stable when exposed to moisture, especially in elevated temperatures, and therefore urea resins are most suitable for interior use. In contrast, the method of the present invention is a method for forming a protective helmet, and it is well known that protective helmets must be used in a wide variety of conditions, includes in moist and warm conditions.

Attachment C is a specification sheet for a urea resin taken from the web page www.custompak.com which notes that urea resins are typically used in wood products, such as the manufacture of plywood and particleboard. Attachment D is a specification sheet for a urea resin published by Cytec Industries, Inc. Under the heading "Applications" of Attachment D it is indicated that the urea resin discussed therein is:

> suitable for the following applications: Furniture, sporting goods, millwork, joint assemblies, hollow core doors, Decorative laminates to plywood, i.e., "Masonite" or lumber cores for dinette, sink, and counter tops. Also steam heated automatic core machines, high frequency core gluers and heated clamp carriers.

However, all of the applications listed in Attachments C and D are indoor applications which are not subjected to the severe hazardous conditions to which a helmet is exposed, which supports the statements in the article of Attachment B that urea resins are suitable only for interior use.

Thus, besides the fact that the Japanese '106 reference itself refers to the resultant product as "flexible," it can be seen that the urea resins used therein are not resistant to heat and moisture. NFPA testing standards require testing under elevated temperatures, as well as testing of a helmet that has been submerged in water for up to several hours. Furthermore, it is commonly understood that a helmet must be able to withstand adverse environmental conditions.

Finally, at page 4 of the translation of the Japanese '106 reference, the fiber cloth of that reference is referred to a "net-like." The drawings of the Japanese '106 reference also disclose that the fabric is "net-like" with openings therein. Thus, if one were to take the fiber cloth of the Japanese reference and use it in the method of the Medwell reference, the resultant structure would have gaps or holes formed therein, which would result in an unacceptable helmet.

Thus, if one were to use the urea resin/ceramic powder combination of the Japanese '106 reference in an attempt to make a helmet, the resultant structure would be a helmet that is flexible and has a low impact resistance, is not stable under moisture and at elevated conditions,

and that has a "net-like" structure. The resultant structure would therefore not be useful as a helmet and would not meet NFPA standards. Thus it is submitted that one of ordinary skill in the art would not be motivated to carry out the proposed modification.

It is noted that the Office action indicates that the Japanese '106 reference teaches that ceramic particles improve impact resistance. However, this feature could not be found in the Japanese '106 patent, and in particular, it is submitted that the resultant impregnated fabric of that reference does not have improved impact resistance.

New claim 56 specify that curing step is carried out until the helmet is generally rigid. New claim 57 specifies that the steps of claim 1 are carried out such that the resultant helmet meets the NFPA helmet testing standards. Thus new claims 56 and 57 further distinguish over the cited references.

Finally, it is submitted that the Office action has not supplied a sufficient motivation for the proposed combination. The motivation for the proposed modification appears to be that "JP 1-145106 specifically teaches that said ceramic particles improves impact and heat resistance, hence improves the protective characteristics of the resulting molded helmet." However, it is submitted that this passage merely refers to an inherent property of ceramic powder, and does not supply a motivation to combine the references in the proposed manner. Although the Japanese '106 reference does mention the "heat retaining" effects of ceramic particles, under the reasoning advanced in the Office action it would be "obvious" to combine the ceramic powder of the Japanese '106 reference with any composition, because to do so would improve the heat resistance of the resultant composition.

Instead, it is submitted that the references must include a particular statement that would suggest to one of ordinary skill in the art the desirability of the proposed modification. As is well known, "[T]here must be a showing of a suggestion or motivation to modify the teachings of the reference....Whether the Board relies on an express or an implicit showing, it must

provide *particular findings* thereto. *Broad conclusory statements* standing alone are not 'evidence.'" *In re Kotzab* 55 USPQ (BNA) 2d 1365 (Fed. Cir. 2000) (emphasis added)).

The basis of the rejection in this application is analogous to the issue addressed in the case of *Arkie Lures Inc. v. Gene Larew Tackle Inc.*, 43 U.S.P.Q. 2d 1294 (Fed. Cir. 1997). In that case the patentee claimed a fishing lure made of a plastisol resin dispersed in an organic solvent, with the plastisol being impregnated with salt. The prior art of that case showed: 1) the use of salty bait, which was attractive to fish; 2) plastisol lures; and 3) the use of organic fish attractants in plastic lures. However, the patentee argued that impregnating plastisol lures with salt was patentable.

In examining the validity of the claims at issue, the Federal Circuit noted that the prior art did not show the combination of a plastisol lure with salt, even through the prior art was extensive as to the separate claim elements. The court then held that the invention was patentable over the prior art, noting that:

> It is insufficient to establish obviousness that the separate elements of the invention existed in the prior art, absent some teaching or suggestion, in the prior art, to combine the elements. Indeed, the years of use of salty bait and of plastic lures, without combining their properties, weighs on the side of unobviousness of the combination.
>
> *Id.* at 1297.

The rationale of the court in the *Arkie* reference is clearly applicable to the facts of this case. Although the Office action indicates that ceramic powder has certain advantageous properties, so did the prior art in the *Arkie* case note that salt in lures is attractive to fish. However, the Office action does not include any motivation or suggestion to combine the references beyond the recital of an inherent property of ceramic powder.

It should be noted that the *Arkie* court also relied upon skepticism of experts of the feasibility of combining salt and plastisol and the commercial success of the invention in rendering its decision. However, several difficulties has to be overcome in the present

invention, including selecting the size of the particles, the amount of ceramic particles to add to the resin and treatment of the resin to avoid settling of the particles, which are features that are noted in the specification. Thus, it is submitted that the similarity of the *Arkie* case to the facts of this case further indicate that the Office action has not provided sufficient motivation for the proposed modification, and that the present invention is not obvious in light of the cited references.

It is noted that the Office action takes the position that one of ordinary skill in the art would take the entire thermosetting resin impregnated fabric of the Japanese reference thereby necessarily including the urea resin, and using such fabric in the process of the Medwell reference (see page 5, first 5 lines). As noted above, it is submitted that one of ordinary skill in the art would not be motivated to carry out the proposed modification. It is possible that, in a subsequent Office action, the Office may take the position that it would have been obvious to one of ordinary skill in the art to use the ceramic powder of the Japanese '106 reference in the resin of the Medwell reference. However, it is submitted that there is not sufficient motivation for such a combination, as outlined above.

The rejection of independent claims 23 and 36 is also traversed for the same reasons discussed above.

Claims 1, 5, 8, 11-13, 15, 17-19, 23, 27, 33-36, 42, 46, 49 and 52-55 are rejected as allegedly defining obvious subject matter over U.S. Pat. No. 5,794,271 to Hastings in view of the Japanese '106 reference. The Office action admits that the Hastings reference does not teach a thermosetting resin impregnated fabric having ceramic particles mixed therein. The Office action then takes the position that it would have been obvious to have provided a thermosetting resin impregnated fabric having ceramic particles mixed therein as taught by the Japanese '106 reference. The Office action indicates that the Japanese '106 reference teaches that ceramic particles improves impact and heat resistance. However, as noted above, it is submitted that one of ordinary skill in the art would not be motivated to use the ceramic fiber of the Japanese '106

reference in a helmet due to the flexibility of the fiber and due to the inherent weakness of the fiber caused by the urea resins. It is also submitted that the Office action does not provide a sufficient motivation for the proposed modification, but instead only recites a property of the ceramic powder as the alleged motivation.

Furthermore, with regards to independent claims 17, 23 and 36, the cited references do not appear to disclose the female mold specified in the claims.

The rejection of claims 2, 20, 24, 37 and 43 is traversed on the basis that the Japanese '320 reference does not disclose chopping ceramic particles. Instead, the Japanese '320 reference discloses grinding, which is of course a different process.

The rejection of claims 4, 26 and 45 is traversed on the basis that, even if the Japanese '459 reference discloses the claimed percentage of weight of the ceramic particles, the Office action does not include sufficient motivation for the proposed combination. In particular, the only proposed motivation for the proposed modification appears to be that the Japanese '106 reference "teaches a moldable mixture of thermosetting resin and ceramic particles." However, it is submitted that the mere fact that one reference refers a "moldable mixture of particles" while another reference refers to particles of a particular concentration does not provide a sufficient motivation to combine the references.

Instead, the range specified in claims 4, 26 and 45 represents a specifically selected and engineered design which provides a helmet with sufficient strength while retaining sufficient heat reflectivity. None of these factors are addressed in the Japanese '459 reference which is instead addressed to the manufacture of a porous ceramic product.

The rejection of claims 3, 25 and 44 is traversed. The Office action appears to admit that the prior art does not disclose the subject matter of these claims, and instead takes the position that "particle size is a result effective variable." However, it is submitted that this is not the case. In particular, particle size depends upon the objective to be achieved, the thickness of the resin, the composition of the particles and resin, and many other factors.

In fact, this case is analogous to the case cited in the Office action, *In re Antoine* 559 F.2d 618 (CCPA). In that case the Court of Customs and Patent Appeals held that the numerical ratio cited in the claims of that application were not obvious. The court held:

> The PTO and the minority appear to argue that it would always be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system even if there is no evidence in the record that the prior art recognized that particular parameter affected the result. As we have said many times, obvious to try is not the standard of 35 U.S.C. §103.

Id at 620.

Similarly, in this case there is no evidence that the cited prior art recognizes any criticality of particle size.

The range of sizes of particles specified in claims 3, 25 and 44 is selected such that the particles can be evenly distributed throughout the resin and provide sufficient heat reflectivity without compromising the strength of the resultant helmet. None of the prior art references reflect this consideration or engineering design behind the claimed range of particle sizes. Thus, it is submitted that the subject matter of claims 3, 25 and 44 is not obvious in light of the prior art. Furthermore, to the extent that the Office action relies upon personal knowledge or facts, documentary evidence of such personal knowledge or facts is requested so that applicant can more fully respond.

New claim 58 depends from claim 1 and specifies an average particle size of between about 3 and about 1000 microns. New claim 59 is an independent product-by-process claim similar to claim 1.

Thus it is submitted that the application is in a condition for allowance, and a formal notice thereof is respectfully solicited.

A Second Supplemental Information Disclosure Statement accompanies this Amendment. The Supplemental Information Disclosure cites U.S. Pat. No. 5,368,922 to Portelli as well as a translation of Japanese Patent 1-145106 (cited by the Office). As noted in the IDS,

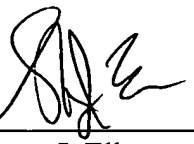
U.S. Pat. No. 5,368,922 was cited in a communication from the International Preliminary Examining Authority in corresponding PCT International Application No. PCT/US01/31310 not more than three months prior to the filing of this supplemental information disclosure statement. The translation of the Japanese reference was known to applicant prior to three months from the filing of this Amendment and IDS. However, it is submitted that no fee is required for consideration of the translation of the Japanese reference because the Japanese reference was already known and cited by the Office. However, should the Office determine that a fee is required for the consideration of the Japanese translation or the IDS, the Office is hereby authorized to charge any fees required under 37 C.F.R. §1.97(c) to Deposit Account 20-0809.

A Request for Three Months Extension of Time and the appropriate fee also accompany this amendment.

The Commissioner is hereby authorized to charge any additional fees required, including the fee for an extension of time, or to credit any overpayment to Deposit Account 20-0809.

The applicant(s) hereby authorizes the Commissioner under 37 C.F.R. §1.136(a)(3) to treat any paper that is filed in this application which requires an extension of time as incorporating a request for such an extension.

Respectfully submitted,

By 

Steven J. Elleman
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MARKED-UP COPY OF AMENDED PORTIONS OF SPECIFICATION

Page 3, 2nd full paragraph:

It is another aspect of the invention to provide a method for fabricating a protective helmet that includes the steps of: (a) providing a male mold component; (b) providing a female mold component; (c) positioning a fiber-based filler between the male and female mold components; (d) mixing course ceramic particles into a thermoset resin, providing a resin mixture; (e) positioning the resin mixture between the male and female mold components; (f) curing the fiber-based [filer] filler and resin mixture together by pressing the male and female mold components together for a curing time. Preferably, the step of positioning the resin mixture between the male and female mold components includes a step of coating at least a portion of the fiber-based sheeting with at least a portion of the resin mixture. It is also preferred that the method include a step of coating at least a portion of one of the male and female mold components with another portion of the resin mixture, prior to positioning the fiber-based filler between the male and female mold components. This pre-coating of the resin mixture helps to reduce the propensity for the ceramic particles to flow to the "low spots" in the helmet during the curing stage; and therefore, this pre-coating step is especially useful for resin mixtures utilizing a ceramic particle that is not as course as that provided in the preferred embodiment.

Page 7, 2nd full paragraph:

Referring back to Fig. 1, in the exemplary embodiment, the major sheeting 24 is broken up into at least two segments 24a, 24b where each segment preferably includes a brim portion and a bowl portion corresponding to the brim and bowl portions of the firefighting helmet.

Again, the multiple segments 24a, 24b, of the major sheeting 24 helps to reduce the number of wrinkles and irregularities in the glass back 10 and to ease in the glass-back assembly process. Finally, a woven glass cloth 26, 30 is applied over the primary sheeting 24 with a light adhesive to act as a rebar. In the exemplary embodiment, the woven glass cloth 30 is comprised of at least two segments [26a, 26b] 30a, 30b to control wrinkles and to simplify the assembly process. When all of the components 20, 22, 24 and [26] 30 of the glass back 10 are fastened together, the glass back 10 is removed from the shell 12 and saved for use as a fiber-based filler in the manufacturing process of the firefighting helmet as will be discussed below.

MARKED-UP COPIES OF AMENDED CLAIMS

1. (Amended) A method for fabricating a protective helmet, comprising the steps of:

providing a fiber-based filler;

mixing course ceramic particles into a thermoset resin, thereby providing a resin mixture;

impregnating the resin mixture into the fiber-based filler;

forming the impregnated fiber-based filler into a shape of a protective helmet; and

curing the resin mixture.

17. (Amended) A method for fabricating a protective helmet, comprising the steps of:

providing a male mold component;

providing a female mold component;

positioning a fiber-based filler between the male and female mold components;

mixing course ceramic particles into a thermoset resin, thereby providing a resin mixture;

positioning the resin mixture between the male and female mold components;

curing the fiber-based filler and resin mixture together by pressing the male and female mold components together for a curing time.

23. (Amended) A method for fabricating a protective helmet, comprising the steps of:

providing a male mold component;

providing a female mold component;

mixing course ceramic particles into a thermoset resin, thereby providing a resin mixture;

coating at least a portion of a first one of the male and female mold components

with a first portion of the resin mixture;

after the coating step, positioning a fiber-based filler over the first portion of the resin mixture in the first mold component;

after the positioning step, applying a second portion of the resin mixture over the fiber-based filler; and

curing the fiber-based sheeting and resin mixture together by pressing the male and female mold components together for a curing time.

36. (Amended) A method for fabricating a protective helmet, comprising the steps of:

providing a male mold component;

providing a female mold component;

mixing ceramic particles into a thermoset resin, thereby providing a resin mixture;

coating at least a portion of a first one of the male and female mold components with a first portion of the resin mixture;

after the coating step, positioning a fiber-based filler over the first portion of the resin mixture in the first mold component;

after the positioning step, applying a second portion of the resin mixture over the fiber-based filler; and

curing the fiber-based filler and resin mixture together by pressing the male and female mold components together for a curing time.

42. (Amended) A method for forming a relatively rigid, fiber composite object comprising the steps of:

providing a fiber-based filler;

mixing course ceramic particles into a thermoset resin, thereby providing a resin

mixture;

impregnating the resin mixture into the fiber-based filler;

forming the impregnated fiber-based filler into a desired shape; and

curing the resin mixture to form a relatively rigid, fiber composite object.